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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/498,336	02/04/2000	Jeffrey A Shields	52352-372	8690

20277 7590 12/31/2001

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EXAMINER

PEREZ RAMOS, VANESSA

ART UNIT	PAPER NUMBER
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1765

DATE MAILED: 12/31/2001

9

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

09/498,336

Applicant(s)

SHIELDS ET AL.

Examiner

Vanessa Perez-Ramos

Art Unit

1765

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 16 October 2001.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-20 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-20 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on _____ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- 11) ☐ The proposed drawing correction filed on _____ is: a) ☐ approved b) ☐ disapproved by the Examiner.
If approved, corrected drawings are required in reply to this Office action.
- 12) ☐ The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

- 13) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).
* See the attached detailed Office action for a list of the certified copies not received.
- 14) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
a) ☐ The translation of the foreign language provisional application has been received.
- 15) ☐ Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

- 1) ☐ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____
- 4) ☐ Interview Summary (PTO-413) Paper No(s). _____
- 5) ☐ Notice of Informal Patent Application (PTO-152)
- 6) ☐ Other:

DETAILED ACTION

Claim Rejections - 35 USC § 103

1. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

2. Claims 1-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Applicant's Admission of the Prior Art, in view of Solis (U.S. 5851302).

In regard to claims 1, 3 and 12-14, Applicant admits that it is well known prior art to: form a plurality of dielectric layers (page 2, lines 3-22); to form a plurality of patterned conductive layers, wherein the conductive layers have gaps or "via openings", and wherein the gaps are filled (page 2, lines 3-22); to deposit photoresist masks, which are later removed (page 6, lines 1-9); and to form through holes that are later cleaned to remove polymeric residues (page 6, lines 9-10). Applicant also admits that it is well known to form borderless vias (page 6, line 3), and, furthermore, Applicant admits the advantages of utilizing gap fill layers and/or dielectric layers having dielectric constants no greater than about 3, such as HSQ, advantages which include: avoidance of poison via problems, reduction of etch back steps, increased planarity and enhanced gap filling, among others.

Applicant does not disclose that the steps of removing the photoresist mask and cleaning the through hole are performed with a plasma containing CF₄ and H₂O, but with an O₂ plasma.

Solis discloses a process for forming via contact holes, including a step of removing a photoresist mask with a plasma comprising CF₄ and H₂O vapor (col. 2, lines 45-64).

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It is the Examiner's position that it would have been obvious to one skilled in the art at the time of the invention to modify the conventional method disclosed by Applicant in his Admission of the Prior Art by removing the photoresist layer with a plasma comprising CF₄ and H₂O, as per Solis, because, as stated by Solis, "an etch gas mixture comprising CF₄ and H₂O exhibits very aggressive ashrate of photoresist" (col. 2, lines 6-9), which is very desirable during semiconductor manufacturing.

In regard to claims 2, 4-11 and 15-20, it is the Examiner's position that the variation of process parameters is obvious to one skilled in the art with the purpose of establishing the best process mode.

Response to Arguments

3. Applicant's arguments filed 10/16/01 have been fully considered but they are not persuasive.

In response to Applicant's argument that there is no motivation to combine or modify the references, it is the Examiner's position that the motivation lies on the fact that both Applicant and the references are semiconductor etching methods, and further are both concerned with the formation of vias or contact holes. It would have been obvious to one skilled in the art at the time of the invention to utilize other known plasma etching compositions for achieving a similar purpose as achieved in the past by another.

In regard to Applicant's argument that Applicant is concerned with low-k materials, while the references are not, it is noted that the layer which is removed is a photoresist mask layer in both Applicant's claimed invention and the references. The plasma which is not disclosed by the primary reference is applied to a photoresist mask, and not to a low-k material layer; therefore, the existence or absence of low-k material layers is not relevant to the issue at bar.

4. **THIS ACTION IS MADE FINAL.** Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the mailing date of this final action.

5. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Vanessa Perez-Ramos whose telephone number is 703-306-5510. The examiner can normally be reached on Mon-Fri 8:30am-5:00pm.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Benjamin Utech can be reached on 703-308-3836. The fax phone numbers for the organization where this application or proceeding is assigned are 703-305-7718 for regular communications and 703-305-3599 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is 703-306-5665.

VPR
December 31, 2001

Vanessa Perez-Ramos
Examiner
Art Unit 1765


FELISA HITESHEW
PRIMARY EXAMINER